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CUSTOM FARM SERVICES IN THE UNITED STATES

STATUS AND POTENTIAL

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ABSTRACT

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SUMMARY

About 11 percent of all farms and 15 percent of all economic class 1-5 farms (those with annual sales of $2,500 or more) earn some income by doing custom work for other farms. Most of the operators who do such work are in the North Central and Southern States. The Census of Agriculture shows that nearly 85 percent of the farms receiving income from custom work in 1969 were in economic classes 1-5. Custom work income for these farms totaled $471 million. Cash grain and livestock farms received the largest share of the income. They also reported larger expenditures for custom work than other types of farms.

Many more farms hire custom services than provide them. About 60 percent of class 1-5 farm operators reported expenditures for machine hire and custom work. Their expenditures amounted to $875 million.

About 46 percent of the custom work was performed by custom operators who are not farm operators, according to the census of agriculture. This figure is consistent with information in a special census of agricultural services, conducted for the first time in 1969. The latter also indicates that farm payments to nonfarm custom operators for machine-related custom services were less than expenditures for other kinds of services, mainly custom cattle feeding, veterinary service, and horticultural service.

A variety of pressures suggest that the use of custom machinery services will probably expand. As commercial farm firms continue to expand, the firms tend to purchase excess machine capacity. They may seek custom work with their excess capacity, to spread fixed cost over more acres. Such farmer-custom operators offer rates that compete effectively with the cost of owning or leasing machines.

In recent years there has been some tendency toward increased specialization among farm types. The specialized farms often need specialized machinery, the market for which may be limited. In addition, use on an individual farm may be small in relation to machine capacity. These factors point toward increased sharing of machine use.

Because machinery sales have declined, domestic manufacturers are tending to concentrate on production of large machines which the smaller farms cannot easily own. Since these farms are declining in number, they are becoming increasingly mismatched to the size of farm machinery currently being produced, and they may be compelled to use greater amounts of custom services. Imports of small machines produced in other parts of the world are another alternative which has developed rapidly.

The farm labor situation may also increase the demand for custom services. It takes skilled labor to handle the machines. Custom operations facilitate hiring of such labor when it is needed, with the annual wage spread over several farming operations.

Regulations concerning pesticides may bring some expansion of custom operations. Under the Federal Environment Pesticide Control Act of 1972, certain dangerous pesticides may only be applied by or under the direct supervision of licensed applicators. Larger operators or custom agricultural service businesses are most likely to meet the required standards for obtaining a license. Others, including smaller operators, would need to purchase their pesticide services.

Potential suppliers of custom machine services include (1) farmer custom operators, (2) custom operators not engaged in farming who provide either use of individual machines or complete farming operations, and (3) machinery dealers or others who provide short-term rentals.

CUSTOM FARM SERVICES IN THE UNITED STATES: STATUS AND POTENTIALS

by

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U. S. farmers have generally owned most of the machinery used on their farms, and manufacturers traditionally have provided a wide assortment of machine sizes to match different farm sizes. Custom or hired farming services have been common only for certain specialized operations, notably wheat combining in the Plains and chemical and fertilizer application in several areas. 1/

The traditional pattern of machinery ownership is now under pressure from both demand and supply forces. On the demand side, the larger and more specialized machines offer operating economies over smaller, general-use machines they can replace. But the large investment cost in buying bigger machines creates, first, a pressure for new farm financing procedures which may separate machine ownership from machine use, and second, an incentive to expand farm size to fully use the machines. On the supply side, it is possible to realize substantial economies in manufacturing greater numbers of machines. 2/ Since the larger machines often offer economies in use on the farm, manufacturers may have incentives to specialize in producing the larger machines. Some of this pressure is offset by planning and producing for a worldwide market, to increase potential sales in each size of machine, and relieve the pressure to produce fewer sizes or options.

These combined pressures could lead to several changes in the way farm production machinery is provided. Among the alternatives are the following: accelerated recombination of land into larger farming units to narrow the range of farm sizes, greater use of custom operations to gain economies of machine use over several separate farms, expanded use of leasing and expanded financing to permit farmers to shift investment costs to financial institutions, or continued manufacture of a wide range of machines in smaller numbers at higher costs per machine.

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1/ Throughout U. S. history functions have been shifting from on-farm to off-farm. Processing and distribution of most products and manufacture of most inputs at one time were functions of the self-sufficient farmer household. Now these are performed by other businesses from which inputs are bought and to which products are sold. The traditional farming methods involve transfer of a product, while custom work is transfer of a service.

2/ See, for example, recent studies by the Canadian Royal Commission on Farm Machinery (7). Underscored numbers in parentheses indicate items in the References, p. 27.

This report examines the existing and potential market for custom farm operations, probably the most significant alternative to the current situation. The report covers four topics: (1) what importance does custom work have in the machinery market, (2) who provides custom services and who purchases them, (3) what changes may occur in the market for custom services, and (4) who would provide expanded custom services. Data used are from the 1969 Census of Agriculture and other secondary sources. These are the latest data available.

MACHINERY USE IN PERSPECTIVE

Machinery is a very important farm sector input, both as an investment cost and as an annual capital user. The January 1, 1974, value of machinery on farms was about $44 billion, or 9.1 percent of farm sector assets. This was about the same percentage as for the livestock inventory, but substantially less than the 68 percent accounted for by real estate (14). As an annual user of funds, machinery ranked first--absorbing some 43 percent of the annual farm sector capital flows, versus 39 percent for land improvements and transfers (9). Annually, about $4.7 billion was required for machinery out of a total capital flow of $11.0 billion from 1965 to 1969. The projection for 1973 was about $6.0 billion out of $13.5 billion (10).

Much of this capital flow was from internal sources--depreciation and income. But the percentage financed by debt grew continuously, from about 12 percent in 1950-54 to about 37 percent for 1970-71, and has been projected to increase to 39 percent for 1975-79 (10). 3/ The rapid growth in debt financing has created pressures on farmers to find alternate ways of acquiring machine services without financing the entire ownership cost. These alternatives include joint ownership, leasing, and custom operations. 4/ Leasing has met only limited acceptance. A recent survey of six major manufacturers of farm machinery 5/ showed that outstanding leasing or rental accounts increased almost three and one-half times from 1967 to 1970, but still amounted to only 2.4 percent of the amount of loans they had outstanding for machinery purchase. Farmers lease unknown additional amounts from banks, commercial finance companies, and other manufacturers, but it is clear that leasing is relatively uncommon and has not achieved the acceptance expected by some of its proponents. Ball (1) suggests that this may have arisen from availability of custom services at a more attractive price. Also, Morris (11) has found financing through purchase to be generally more attractive than through leasing.

3/ Merchants and dealers provided an estimated third of financing for tractors, machinery, autos, and trucks, or some $948 million in 1969 compared with $1.04 billion in 1964.

4/ As a relatively close substitute for custom operations, joint ownership may be affected by similar forces. However, management problems have generally been more of an impediment with joint ownership than with custom operations.

5/ E. T. Hamlin, "Manufacturer Financing of Farm Machinery and Equipment Sales and Rentals to Farmers, 1963-70," unpublished working paper, Econ. Res. Serv., U. S. Dept. Agr., May 1972.

THE NATURE OF CUSTOM OPERATIONS

What kinds of individuals do custom work? What kinds of farms hire it? How much is neighborhood exchange and how much is provided by full-time custom operators? When is it done? In this section custom work is examined as a source of income to farm operators, as an expense to farm operators and landlords, and as an income source to persons who are not farm operators. Data on income from custom work were collected for the first time in the 1969 Census of Agriculture. Data on expenditures for machine hire and custom work are available in the 1969 and earlier censuses. A census of agricultural services is also available for 1969, containing data from firms which provide custom agricultural services as their primary business. These data are summarized separately as income and expense and then are combined.

Custom Work Income of Farm Operators

Custom work and other agricultural services 6/ were a source of income on 11 percent of all farms and 15 percent of economic class 1-5 farms in 1969. 7/ Average receipts for those having custom earnings were $1,661 on all farms and $2,719 on class 1-5 farms. The total income to farm operators from custom work, about $510 million, was about 1 percent of gross farm income.

By Region

Farmers received significant income for custom work in all regions, but both numbers and income were concentrated in the North Central and Southern regions (tables 1 and 2). The largest total dollar amounts and the highest percentage of farms having custom earnings were in the West North Central States (table 2) where $135 million was received and nearly 16 percent of the farms reported income from custom work (table 1). The largest amounts received per farm doing custom work were in the Pacific States, averaging

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6/ The census form gives examples for "custom work and other agricultural services," but allows the farm operator to decide what is to be included. All examples appear to be of custom work, and most of the amount reported is probably custom work. Other possible kinds of agricultural services performed by farm operators, which could conceivably be included, are indicated in table 11. This could include income from hiring machines, for custom feeding of cattle, and the like. In some cases, farmers may report both the costs of goods purchased (fertilizer, chemicals, etc.) and the cost of application.

7/ Class 1 farms are those with gross annual receipts of $40,000 or more; class 2, $20,000 to 39,999; class 3, $10,000 to $19,999; class 4, $5,000 to $9,999; class 5, $2,500 to $4,999. The other classes--class 6 (under $2,500), part time, and part retirement--together account for less than 5 percent of gross receipts from all farm marketings.

Table 1--Percent of farms with income from custom work, and income per farm doing custom work, by regions, 1969

Region	Farms with income from custom work		Income from custom work	
	All	Classes 1-5	All	Classes 1-5
	Percent of farms		Dollars per farm	
United States	11.2	15.0	1,661	2,719
Northeast	8.9	10.8	1,378	1,570
New England	8.6	9.0	1,956	2,453
Middle Atlantic	9.0	11.2	1,250	1,400
North Central	14.6	17.8	1,263	1,303
East North Central	13.2	17.2	1,130	1,187
West North Central	15.7	18.3	1,354	1,379
South	8.0	11.6	1,772	2,162
South Atlantic	7.5	10.1	1,718	2,174
East South Central	7.1	10.8	1,348	1,786
West South Central	9.4	13.4	2,125	2,375
West	12.0	14.6	3,571	3,944
Mountain	13.6	16.0	2,365	2,503
Pacific	10.6	13.3	4,853	5,592

Derived from appendix table 2.

Table 2--Distribution of farms and income from custom work and agricultural services, by regions, 1969

Region	Farms with income from custom work		Income from custom work	
	All	Classes 1-5	All	Classes 1-5
	Percent		Percent	
United States	100.0	100.0	100.0	100.0
Northeast	5.6	5.6	3.7	3.5
New England	1.0	1.1	1.0	0.9
Middle Atlantic	4.6	4.5	2.7	2.6
North Central	42.2	50.1	41.7	42.9
East North Central	18.8	20.5	15.1	15.4
West North Central	23.4	29.6	26.6	27.5
South	42.5	33.6	32.4	30.9
South Atlantic	13.6	11.1	9.4	9.0
East South Central	14.3	9.5	7.3	6.7
West South Central	14.6	13.0	15.7	15.2
West	9.7	10.7	22.2	22.7
Mountain	4.4	5.2	7.6	7.7
Pacific	5.3	5.5	14.6	15.0

Derived from appendix table 2.

$4,853 on all farms and $5,592 on class 1-5 farms. Although data do not indicate the type of work performed, these areas are important in wheat and feed grains and in fruits and vegetables.

Custom work income varied widely among individual States in the Corn Belt, Plains, and Delta regions (table 3), and especially on class 1-5 farms. Amounts earned per farm were moderate in all States, however. Over one-fifth of Illinois and Kansas farms in economic classes 1-5 showed income from custom work, probably corn, soybean, and wheat combining. Small amounts of custom earnings were relatively common for farm operators in all the Central Corn Belt and Plains States. In contrast, only about one-tenth of the Delta farms had custom earnings, but per farm custom income for those doing custom operating was about $2,500, almost double that of the Corn Belt. Fewer farm operators were providing more specialized custom services to other farms in the Delta.

By Economic Class

Custom earnings were widely divided among economic classes of farms, and each class showed wide variation in amounts of custom work earnings (table 4). Nearly 85 percent of the farms receiving custom work income were economic class 1-5 farms and they received 93 percent of the reported income from custom work. Class 1 farms had the largest average income, $3,314. Classes 2-5 all averaged between $1,600 and $1,200 per farm. The percentage of farms having custom work income declined from 22 for class 1 to 8 for class 5. Only 8 percent of the farm operators in all economic classes reported over $1,000 income from custom work, and only 6 percent of class 1-5 farmers did so. This suggests that most custom services are provided as part of excess machine capacity on individual farms rather than as a major activity of a subgroup of farm operators.

By Farm Type

Cash grain and livestock farm operators received nearly 63 percent of custom work income, although they comprised only 37 percent of class 1-5 farm operators. For each of these two farm types, from 15 to 20 percent of the operators reported custom income (table 5). However, their earnings were small--less than $2,000 per farm doing custom work. From 15 to 20 percent of the operators of cotton and other field crop farms also did custom work, but earnings per farm were considerably higher. Cotton farms reported $2,800 and other field crop farms $3,827. Only about 10 percent of fruit and nut farms and vegetable farms had custom work income, but per farm earnings were the highest of any type--$5,882 for fruit and nut and $4,754 for vegetable farms.

Table 3--Percent of farms and income per farm with custom work in selected wheat, feedgrain, and cotton producing areas in 1969

Region and State	Farms with income from custom work		Income from custom work	
	All	Classes 1-5	All	Classes 1-5
	Percent of farms		Dollars per farm	
Corn Belt	12.6	16.1	1,279	1,323
Ohio	12.9	18.5	1,027	1,123
Indiana	12.8	17.4	1,106	1,145
Illinois	17.2	20.2	1,342	1,367
Iowa	17.9	19.7	1,385	1,394
Missouri	2.4	3.5	1,843	1,924
Plains	17.1	19.0	1,455	1,465
North Dakota	16.5	17.7	1,152	1,158
South Dakota	16.0	17.3	1,405	1,405
Nebraska	16.8	18.5	1,616	1,643
Kansas	18.3	21.3	1,470	1,473
Delta	7.6	8.6	1,983	2,521
Arkansas	8.5	11.6	1,939	2,260
Louisiana	6.5	9.8	2,411	2,991
Mississippi	7.4	6.3	1,804	2,562

Derived from appendix table 3.

Table 4--Range in income from custom work and other agricultural services, by economic class of farm, United States, 1969

Economic class	Farms	Income from custom work							Average earnings per farm doing custom work
		None	$1-$249	$250-$499	$500-$999	$1,000-$4,999	$5,000-$9,999	$10,000 and over	
	Number	- - - - - - - - - - - -Percent of farms- - - - - - - - - - - - -							Dollars
1	221,690	78.5	3.5	3.0	4.0	8.2	1.6	1.2	3,314
2	330,992	78.8	5.1	3.8	4.3	6.7	0.8	0.5	1,635
3	395,472	83.2	4.7	3.0	3.2	4.8	0.7	0.4	1,491
4	390,425	88.6	3.6	2.1	2.0	3.0	0.5	0.2	1,325
5	395,104	92.2	2.8	1.4	1.2	2.0	0.3	0.1	1,292
Classes 1-5	1,733,683	85.0	3.9	2.6	2.8	4.6	0.7	0.4	1,812

Derived from appendix table 4.

Table 5--Range in income from custom work and other agricultural services, class 1-5 farms by type, United States, 1969

Type of farm	Farms	Income from custom work							Average earnings per farm doing custom work
		None	$1-$249	$250-$499	$500 $999	$1,000 $4,999	$5,000 $9,999	$10,000 and over	
	Number	- - - - - - - - -	- - - -	- - - -	-Percent of farms-	- - - -	- - - -	- - - -	Dollars
Cash grain	369,312	79.1	4.5	3.4	4.2	7.2	1.1	0.5	1,743
Tobacco	89,903	92.5	2.6	1.2	1.2	2.1	0.3	0.1	1,366
Cotton	40,534	82.4	2.3	2.2	3.3	7.4	1.5	0.9	2,800
Other field crop	31,190	82.6	2.8	2.4	3.2	6.6	1.3	1.1	3,827
Vegetable	19,660	89.4	2.3	1.3	1.4	3.6	0.8	1.2	4,751
Fruit and nut	53,754	89.9	1.8	1.1	1.3	3.3	1.2	1.4	5,882
Poultry	57,545	93.2	1.7	0.9	1.1	2.1	0.6	0.4	2,774
Dairy	260,956	86.8	5.2	2.6	2.4	2.6	0.3	0.1	971
Livestock farm excl. poultry and dairy	568,201	85.0	4.3	2.8	2.9	4.2	0.5	0.3	1,412
Livestock ranch	79,683	93.4	1.4	0.9	1.1	2.4	0.5	0.3	2,639
General	126,527	80.5	4.5	3.1	3.6	6.5	1.1	0.7	2,042
Miscellaneous	36,418	93.8	1.3	0.8	0.7	1.8	0.7	0.9	6,870
All types	1,733,683	85.0	3.9	2.6	2.8	4.6	0.7	0.4	1,812

Derived from appendix table 5.

Custom Work Expenditure by Farm Operators and Landlords

Many more farmers hire custom services than provide such services, and the demand for these services, like the supply, is widely diffused among farms.

While 15 percent of class 1-5 operators reported income from custom work, nearly 64 percent reported expenditures for either contract labor, machine hire, or custom work, averaging $1,220 (table 6). 8/ Only about one-third of the class 6, part time, and part retirement farms had such expenses and their average expenditure was less than $200.

The total dollar expenditure for these services was $1.4 billion, or an average of $959 per farm. Class 1-5 farms accounted for $1.3 billion or approximately 95 percent of the total expenditure. This represented about 2.3 percent of class 1-5 farm production expenses, or less than half the expense for gas and oil for owned equipment. Amounts per farm were mostly under $5,000, and for a large percentage were under $500 (table 7).

By Economic Class

Contract labor can be separated from machine hire and from custom work for class 1-5 farms (table 7). Custom work and machine hire expense averaged $2,391 on class 1 farms, almost 2 3/4 times as much as on any other class. However, custom work was a greater share of total farm expense on the smaller farms, approaching 5 percent (table 7). The very large farms, with sales over $100,000, used only slightly less custom services, but the total bill was only 1.3 percent of their total farm expenses.

By Type

Custom expenses were a larger percentage of total expenditures on crop farms than on livestock farms, but custom expenditure was as frequently reported on some livestock farms as in crop farms (table 8). Over 60 percent of cotton, other field crop, dairy, livestock, and general farms reported custom expenses. On the farms with livestock, these expenses averaged less as a percentage of total expense as well as in amount per farm, and were probably concentrated in such specialized operations as hay and silage making. Less than half the vegetable farms had custom expense, but those which did averaged $2,646, the highest of any type.

8/ Custom work includes the services of a machine operator. Machine hire is probably also included in the income data reported earlier on custom hire and other agricultural services.

Table 6--Expenditures for contract labor, machine hire, and custom work, all farms, United States, 1969

Economic class	Farms	Expenditures								Average expenditure per farm hiring
		None	$1- $99	$100- $499	$500- $999	$1,000- $2,499	$2,500- $4,999	$5,000- $9,999	$10,000 and over	
	Number	- - - -	- - - -	- - - -	- - - -	-Percent of farms-	- - - -	- - - -	- - - -	Dollars
All farms	2,730,250	46.4	10.4	24.4	9.2	6.5	1.9	0.8	0.4	959
Classes 1-5	1,733,683	36.3	7.4	27.9	13.6	9.9	2.9	1.2	0.8	1,220
Class 6	192,564	66.8	14.1	17.0	1.6	0.4	0.1	*	-	188
Part time	574,546	63.0	16.0	18.9	1.7	0.4	*	*	-	180
Part retirement	227,346	64.4	15.3	18.3	1.6	0.3	0.1	*	-	177
Abnormal	2,111	61.4	2.3	11.5	7.0	7.5	4.2	3.2	2.9	3,485

* Indicates less than 0.1 percent.

Derived from appendix table 6.

Table 7--Expenditures for machine hire and custom work, economic class 1-5 farms, United States, 1969

Economic class	Farms	Expenditure						Average expenditure per farm hiring	Expenditure as a percent of total farm expense
		None	$1-$499	$500-$999	$1,000-$4,999	$5,000-$9,999	$10,000 or more		
	Number	- - - - - -	- - -Percent	of farms- - -	- - - - -	- - - -	- - - -	Dollars	Percent
Total	1,733,683	39.4	35.5	13.0	11.1	0.7	0.3	831	2.4
Class 1	221,690	35.3	20.0	14.0	24.5	3.8	2.4	2,391	1.6
Class 2	330,992	32.6	31.7	17.2	17.5	0.9	0.1	867	2.8
Class 3	395,472	35.3	37.9	15.2	11.4	0.2	*	625	3.8
Class 4	390,425	41.7	40.2	11.8	6.2	0.1	*	464	4.8
Class 5	395,104	48.7	40.3	8.1	2.8	0.1	*	361	4.7
Class 1A 1/	51,995	39.7	52.7				7.6	5,679	1.3

* Indicates less than 0.1 percent.

1/ Gross annual receipts of $100,000 or more.

Table 8--Percent of farms reporting specified expenditures for machine hire and custom work, by type of farm, 1969

Type of farm	Number of farms	Expenditure						Expenditure per farm hiring	Expenditure as percent of total farm expense
		None	$1- $499	$500- $999	$1,000 $4,999	$8,000 $9,999	$10,000 or more		
	Number	- - -	- - -	- - -	-Percent-	- - -	- - -	Dollars	Percent
Cash grain	369,312	66.4	32.2	16.1	15.9	1.1	0.3	949	4.8
Tobacco	89,903	42.7	45.7	7.2	3.3	0.9	0.2	340	3.0
Cotton	40,534	33.9	22.3	16.0	23.6	2.7	1.5	1,826	6.0
Other field crop	31,190	35.1	24.6	14.6	21.2	2.6	1.9	1,973	3.6
Vegetable	19,660	52.5	25.2	7.4	10.4	2.1	2.4	2,646	2.5
Fruit and nut	53,754	48.0	26.4	9.6	13.4	1.6	1.0	1,433	2.8
Poultry	57,545	61.8	26.9	6.8	4.2	0.2	0.1	543	0.3
Dairy	260,956	36.6	43.1	12.5	7.6	0.2	*	522	1.9
Livestock other than poultry or dairy	568,201	36.8	38.8	13.9	10.0	0.4	0.1	651	1.8
Livestock ranches	79,683	58.7	23.4	8.4	8.4	0.8	0.3	966	1.3
General	126,527	33.6	35.3	14.7	14.4	1.2	0.8	1,196	5.0
Miscellaneous	36,418	69.7	20.9	4.2	4.4	0.5	0.3	850	1.0
Total, economic classes 1-5	1,733,683	39.4	35.5	13.0	11.1	0.7	0.3	831	2.4

* Indicates less than 0.1 percent.

Derived from appendix tables 7-18.

Custom Work Income of Nonfarm Machinery Operators

Nearly half of the custom farmwork was done by custom operators who were not farm operators. For class 1-5 farm operators, income from custom work was only 54 percent of their custom work expense. A small amount of the difference may have been due to some reporting errors in the census or to differences in items reported on the income and the expense questions. But most of it represented payments to nonfarmer custom operators for such services as fertilizer application, flying services, custom combining, spraying, grinding and mixing feed, corn picking, silo filling, and plowing.

By Economic Class

All economic classes showed net expenditures for custom work, which indicates there are major types of custom services which farmers do not provide to other farmers.

Class 1 farms hired more nonfarm custom services, received more custom income, and had more custom expense than any other economic class. They represented 12.8 percent of class 1-5 farms, but received 33.5 percent of the custom work income and reported 39.2 percent of the expense for the five classes. Very large class 1 farms (class 1-A--sales over $100,000) showed similar excess of expense over income for custom work.

By Type of Farm

Cash grain and livestock farms reported the largest amounts of custom income and custom expense. Nonfarm custom services were important on all farm types (table 9), though relatively less significant on poultry, tobacco, and fruit and nut farms. Only the "miscellaneous" farms showed more income than expense for custom work. These included firms specializing in nursery and greenhouse products, forest products, horses, ponies, fur animals, bees, and goat milk, as well as institutional farms and Indian reservations.

By Kind of Service

A special census of agricultural services, conducted for the first time in 1969, generally supports the figure of $400 to $500 million net inflow of machine-related custom services to farms. It also shows that a high proportion of reported agricultural services are not farm related, and that field machinery services are not the most significant category of farm-related custom services. The 10 services yielding highest gross returns are shown in table 10.

Reports were provided by 32,565 establishments whose primary source of gross income was providing agricultural services, both to farm operators and to other persons. Four main categories are identified: Animal husbandry (mostly veterinary) accounted for 39.7 percent of gross receipts for the

Table 9--Income and expenditure for custom work by farm operators, 1969 1/

Category	Income from custom work and other agricultural services	Expenditure for machine hire and custom work	Difference
	Thousands of dollars		
All farms	509,613	N.A.	N.A.
Economic class 1-5 farms	471,389	875,061	-403,672
Class 1	157,746	342,791	-185,045
Class 2	115,636	193,275	-77,639
Class 3	99,196	160,277	-61,081
Class 4	58,840	105,576	-46,736
Class 5	39,971	73,142	-33,171
By type:			
Cash grain	134,675	230,134	-95,459
Livestock	120,657	233,860	-113,203
General	50,603	100,487	-49,884
Dairy	33,347	86,695	-53,348
Fruit and nut	31,871	40,061	-8,190
Other field crops	20,759	39,980	-19,221
Cotton	19,971	48,888	-28,917
Miscellaneous	15,463	9,352	+6,111
Livestock ranches	13,941	31,787	-17,846
Poultry	10,939	11,917	-978
Vegetable	9,948	24,708	-14,760
Tobacco	9,215	17,192	-7,977

1/ The income figure and the expense figure are not exactly comparable. Expense would include machine rental, which is not believed to be significant. A few agricultural services of farm operators might be included in income, though no examples are cited on the census questionnaire.

Derived from appendix tables 7-18.

Table 10--Ten agricultural service activities yielding highest gross receipts, 1969

Rank	Service	Share of reported gross receipts
		Percent
1	Veterinary--pets and small animals	16.1
2	Shrub and tree service	11.9
3	Cattle feedlots and yards for fattening	11.8
4	Lawn and garden services	10.6
5	Veterinary--livestock and farm animals	8.1
6	Poultry hatcheries	6.9
7	Sorting/grading/packing/shipping fruits and vegetables	3.4
9	Landscape planning and counseling	3.2
10	Crop dusting and spraying	3.2
	All others	20.7

U. S. Census of Agriculture, Vol. III, Agricultural Services, 1969, summary table VII.

reporting establishments, horticultural services (mostly lawn and garden) 42.5 percent, hunting, trapping, and game propagation only 0.3 percent, and other agricultural services about 17.5 percent.

Four of the 10 most important agricultural services were nonfarm. Veterinary service for pets and small animals, shrub and tree service, and lawn and garden service were three of the top four in receipts (table 10). The two largest single categories of farm-related services were custom cattle feeding and veterinary service for farm animals. Neither is directly related to farm machinery use, and it is not likely that either would have been reported by farmers in the regular census as machine hire and custom work expense or as income from custom work and other agricultural services.

Each category is further subdivided as indicated in table 11. Machine hire and custom work could be most closely related to the $515 million for "other farm related" services. But labor crew leader services would be reported by farmers as contract labor, and expense for farm management services would not be related to machine hire, although farmers' income from these services might be included in income from custom work and other agricultural services. In addition, farmers might report some of the agricultural services related to machine hire and custom work in other

Table 11--Gross receipts for nonfarm and specified farm-related agricultural services, 1969

Service	Gross receipts
	1,000 dollars
Nonfarm	952,255
Farm related:	
Services for farm animals	1,141,815
Veterinary and animal hospital	168,990
Poultry hatchery	144,636
Artificial insemination, animal breeding	47,670
Dairy cow testing	7,961
Cattle feedlots for fattening	246,681
Other animal husbandry	10,145
Total	626,083
Other farm related:	
Cotton ginning	70,670
Cotton ginning and warehousing	5,579
Cotton delinting	3,896
Custom grain grinding and milling	24,660
Corn--harvesting, drying, shelling	4,357
Hay--mowing, raking, baling	4,704
Combining and threshing	8,456
Hulling, shelling edible tree nuts	6,138
Sorting, grading, packing of fruits	86,002
Sorting, grading, packing of vegetables	52,481
Picking edible tree nuts	236
Picking fruits and berries	39,913
Harvesting, vegetables	9,476
Crop drying, other than corn	8,334
Citrus grove cultivation and maintenance	34,447
Crop dusting and spraying	66,170
Hauling, spreading of line and fertilizer	22,955
Plowing and seedbed preparation	2,553
Crew leader and labor contractor	40,889
Farm management services	10,482
Miscellaneous	13,334
Total	515,732

Summary table VIII, U. S. Census of Agriculture, 1969, Vol. III, Agricultural Services.

categories. For example, custom spreading of fertilizer would probably be reported as part of fertilizer expense. Subtracting only the expense for crew labor and farm management services, the "other farm related" total is $464.4 million, compared to a custom work deficit of $403.7 million (table 8) in the farmer-reported data. This discrepancy could represent differences in items included in the income and expense reports, errors in reporting, services provided to farms other than classes 1-5, and other farm-related services provided to persons who are not classified as farmers. Thus, while the data from these two sources are not directly comparable, they are roughly consistent.

Summary of Findings

Five significant general conclusions may be drawn as to the status of custom farming: (1) Custom services provide a significant but small portion of machinery services used on farms; (2) class 1-5 farms are the major sources of farmer-provided custom services; (3) class 1-5 farms hire most of the custom services; (4) about one-fifth of the class 1-5 farms do custom work and about two-thirds hire it, suggesting some specialization on the part of those farms providing services; and (5) non-farm custom operators provide almost half of the total custom services.

POTENTIALS

Potential for Custom Farm Machinery Services

Most field operations with farm machinery are performed with machinery owned by the farm operator. However, a variety of pressures suggest that the use of custom services will probably expand. Both demand and supply forces are at work.

Economies of Size

One reason for expecting increases in custom operations is the continued growth in size of commercial farm firms. As these units expand, timeliness of operations becomes critical, and these firms tend to purchase excess machine capacity. They also tend to hire custom operators in some situations. Operators may seek custom work with their excess capacity, to spread fixed cost over more acres. Such custom work offers savings over ownership for those hiring and economies of ownership for farmers doing the custom work. As Ball (1) noted, these custom operators offer rates that compete effectively with equipment leasing. Further, some farmers may deliberately buy excess machine capacity as a part of their strategy for acquiring more land. It is widely believed that landlords prefer to rent land to well-equipped farmers.

Specialization in Farming

In recent years, there has been some tendency toward increased specialization among farm types (15). The specialized farms often need specialized machinery, the market for which may be quite limited. In addition, use on an individual farm may be small in relation to machine capacity. These factors point toward increased sharing of machines, possibly through custom work.

The trend toward fewer farms with larger machine power requirements is already a well-established pattern. Wheel-type farm tractor shipments bulged to meet pent-up demand after World War II, and since the early 1950's have appeared to fluctuate around a declining trend (figure 1). The number of tractors shipped reached a high of 556,000 in 1951 and declined to less than 300,000 in all years since 1960. The same general trends hold for pickup balers, grain combines, corn heads for grain combines, and corn pickers (figure 2). The number of tractors per 1,000 acres of crops harvested increased rapidly from 1950 through 1965, then stabilized or declined slightly from 1965 to 1969 (figure 3). However, tractor size (horsepower) increased rapidly. Horsepower per 1,000 acres increased from less than 3 in 1950 to almost 7 in 1969.

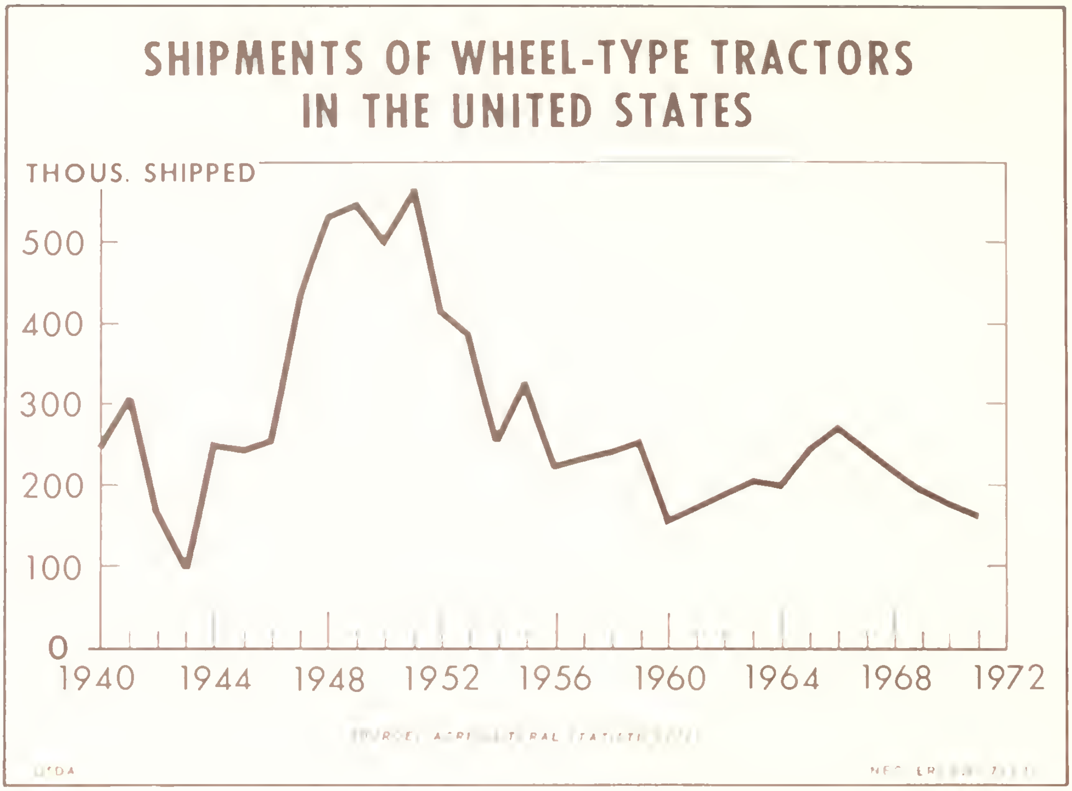
Capital Requirements

The changing structure of farming in recent years has been evidenced by drastic changes in the way agricultural production units achieve growth (6). Traditionally, an important source of capital for acquiring services has been retained earnings or savings from the farm business, which are used to buy resources yielding the services. If heavy reliance is placed on net earnings for investment funds, then growth may be quite slow. However, income generated by the farm business can be supplemented by off-farm work, rental or leasing, credit or debt, custom services, vertical integration, etc., to acquire services of resources owned by others. 9/ Thus, the emphasis on growth through acquiring control of resource services rather than owning resources outright has created an atmosphere potentially favorable to those firms offering resource services to farmers. Likewise, small farms, lacking financial means to own machines which are very expensive or very specialized, may well consider methods other than purchase for gaining access to these services.

Availability of Machines

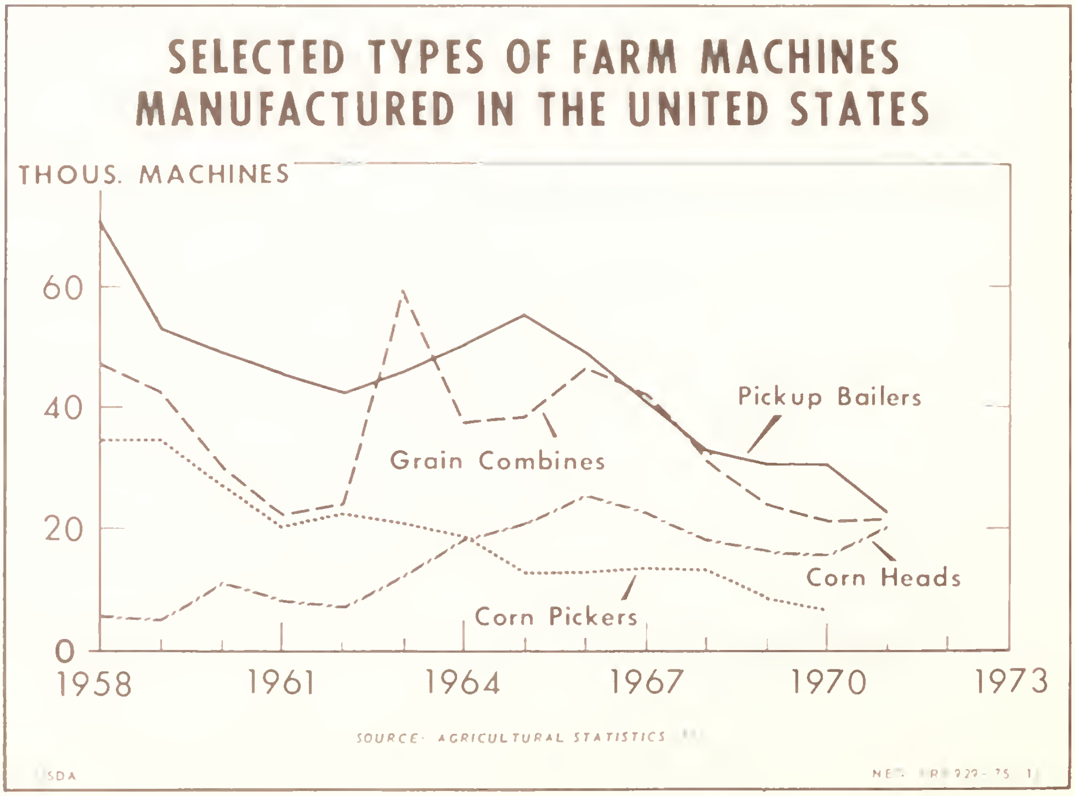
In face of declining unit sales, an economic reaction is to narrow the number of product lines manufactured in order to attain production scale economies. This encourages manufacturers to concentrate on production of larger units. Yet, as table 12 indicates, the farm size distribution has not narrowed similarly.

9/ For a more detailed discussion of these ideas, see (2, 3, 6).


SHIPMENTS OF WHEEL-TYPE TRACTORS IN THE UNITED STATES

SOURCE: AGRICULTURAL STATISTICS

Figure 1


SELECTED TYPES OF FARM MACHINES MANUFACTURED IN THE UNITED STATES

SOURCE: AGRICULTURAL STATISTICS

Figure 2

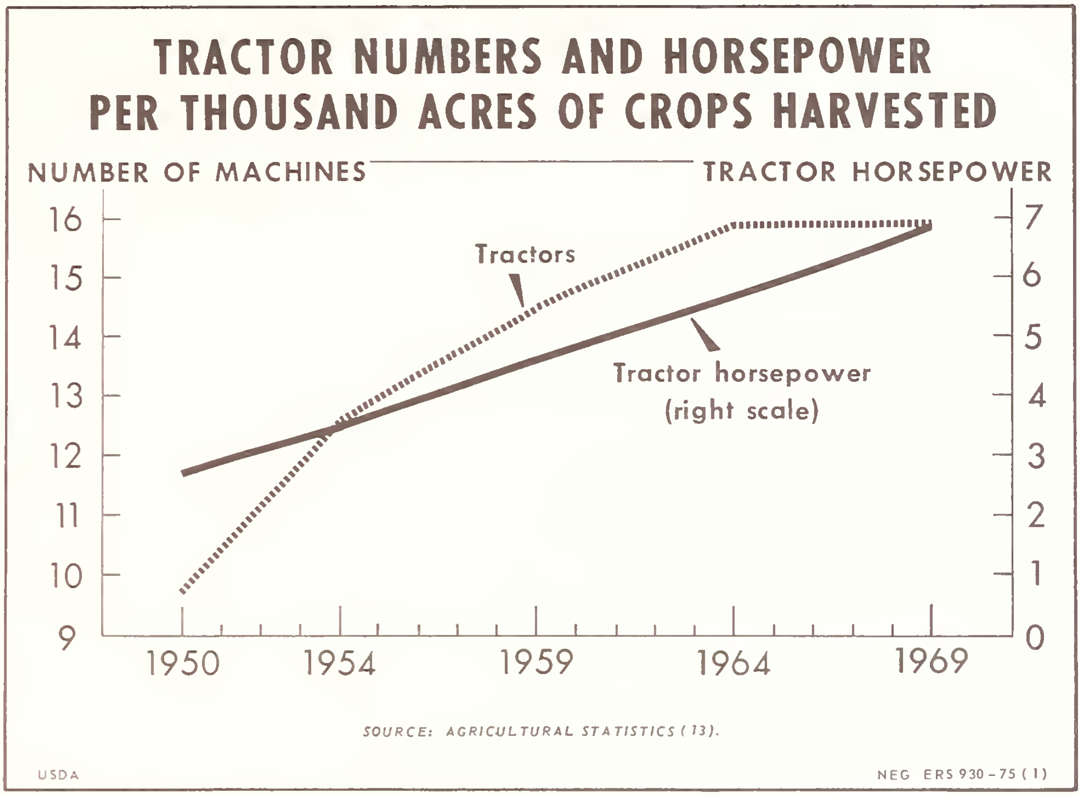


Figure 3

Table 12--Distribution of farms by economic class, 1959, 1964, and 1969

Economic class and value of sales	1959	1964	1969
		Percent of farms	
1 ($40,000 or over)	2.8	4.5	8.1
2 ($20,000-$39,999)	5.7	8.2	12.1
3 ($10,000-$19,999)	13.0	14.8	14.5
4 ($5,000-$9,999)	17.6	16.0	14.3
5 ($2,500-$4,999)	16.6	14.1	14.5
6 (under $2,500)	9.4	11.0	7.1
Part time	23.9	20.0	21.0
Part retirement	10.9	11.0	8.3
Abnormal	0.1	0.1	0.1

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, ch. 7.

One of the major questions this report raises is the potential for use of large machines on smaller farms. It is clear that "smaller" farmers are not providers of custom services. But they use custom services in relatively large amounts, particularly if we include class 4 and 5 farms (sales under $10,000) in the small category.

The number of farms in these groups is not declining more than proportionately, and the part time category is actually increasing in and around metropolitan areas. Such units are becoming increasingly mismatched to the size of farm machinery currently being produced for larger operations. The used-machinery market may thus become a less competitive source and may open the door for custom operations. However, smaller models which are being manufactured in Europe and Japan for worldwide markets may compete increasingly with custom operators in providing machine services on smaller farms. Important questions of economies in use must be studied to evaluate these alternatives.

Economies of Labor

The farm labor situation may also increase the demand for custom services. A custom operation provides both machine and operator. As farm-nonfarm labor markets have become more closely linked and farms have become more specialized, labor needs have become seasonally peaked and difficult to meet. In addition, skilled labor is increasingly required to handle the machines. Custom operations allow the hiring of such labor on a need basis, with the overhead, or annual wage, spread over several farming operations.

Ties to Product Sales

The nonfarm portion of custom services comes from varied sources, although it is believed that a major part comes from fertilizer distributors, chemical companies, and other firms selling inputs to farmers. These firms may price services very favorably as an alternative to discounting the price of their product in a competitive market, and thus present an attractive alternative to machine ownership by farmers. In addition, they have the opportunity to spread the use of a machine over a longer period, over several farms. Other custom operations by nonfarmers may be offered solely as a business, and thus have to be fully priced to recover all cost. Still, they offer the opportunity to spread fixed cost, and thus for some operations may be less costly than ownership.

Public Regulations

The current concern with environmental quality suggests a potential expansion of custom operations. Much interest has recently centered on the use of agricultural chemicals--fertilizer, herbicides, and pesticides. Recent legislation affecting farming is on the Federal Environment Pesticide Control Act of 1972 (FEPCA) passed in October 1972. The primary purpose of the Act is to extensively amend the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), to change it from a labeling act into a use, classification, and regulatory act. This statute controls the manufacture, distribution, and use of pesticides. One of the provisions of FEPCA is to classify pesticides into two categories--general use and a more dangerous restricted use. Pesticides in the latter category could only be applied by or under the direct supervision of licensed pesticide applicators. In addition, there are two types of pesticide applicators--commercial and private. Private pesticide applicators are expected to be farmers. All applicators are certified and required to exhibit satisfactory knowledge and ability to safely apply pesticides. But private applicators' knowledge and ability are likely to be limited to problems associated with the commodities they produce.

The implications for farmers are quite clear. Only those meeting the standards could be certified. Larger operators or custom agricultural service businesses are more likely to be certified. Others, including smaller operators, would need to purchase their pesticide services.

Who Would Provide Custom Services?

Separation of machine ownership from use allows farm producers to avoid prepayment for future machine services, and thus to extend limited capital into a larger volume operation. In this way, it fosters farm firm growth. But it also creates one or more new levels or stages in the production process. Potentially, these stages might be split off into separate businesses--one firm providing financing, a second firm operating equipment, a third firm hiring services for farm production. Among the important alternatives are these: (1) some farmers would own the equipment and do custom work, (2) independent companies would own or lease equipment and provide custom service, and (3) independent companies, manufacturers, or finance organizations would rent or lease equipment to farm operators.

Whether these would impinge significantly on the traditional pattern of farmer ownership is not known. The question requires a functional breakdown of the cost components of various aspects of economies of ownership as well as economies of use for major farm machines. It also requires an understanding of pressures which may affect machinery manufacturers and other businesses. In addition, machine ownership by farmers is a long-ingrained tradition, so psychological resistance to certain patterns may be an important determinant. These are important areas requiring more detailed examination than can be provided here. The following section outlines some components of the custom services market which must be studied.

Custom Work vs. Custom Farming

Functionally, two distinct kinds of custom farm services must be distinguished. Custom work is the provision of individual operations by other farmers, farm suppliers, or specialized firms. Custom farming is provision of the entire package of services involved in producing and harvesting a crop, usually by a specialized operator, usually on a per acre or some other fee basis. Both offer the potential for using larger machines on smaller farm operations, thus breaking the machine size-farm size link, and permitting economies of manufacture. But the two have distinctly different prospects and potentials. Custom work represents functional specialization to a greater degree than custom farming. It requires either a large volume (acreage), if done by specialized firm or supplier, or excess machine and labor capacity if done by a farmer.

An interesting situation in the Corn Belt may be suggested to point out the differences. A large percentage of farmland is rented by operators, and recent price levels have caused landowners to question traditional rental arrangements (8). If operators begin to use custom services, alert landlords may ask, "Why not contract directly with a custom farming operator and eliminate the tenant-middleman?" 10/ Or, an alert custom farmer might seek out arrangements with landlords. Custom farming allows the custom operator to specialize and spread machine fixed costs over more acres, and thus offers another solution to the dilemma of machine size versus farm size. The unanswered question is whether the gain is enough to offset any losses in timeliness or increased cost to the landlord for management supervision.

Neighborhood vs. Between-area Custom Work

The provision of custom services is by no means new. It has been practiced for years in certain sections of the country and for certain commodities. Both peanuts and feed grains are often dried on a custom basis. Wheat farmers from Texas to Canada have relied on custom harvesters for years, and many large wheat farmers in the Great Plains have never owned a combine. Custom cotton harvesters are now active in the Cotton Belt from East to West, though often associated with local processing facilities. What is the potential for this nationwide movement between areas for other major crops such as corn and soybeans?

Planting and harvesting dates for corn, soybeans, and wheat, by regions, are shown in table 13. The harvesting dates for wheat are seen to progress from southern to northern States between the first of June and the end of August. Thus, the possibility exists for custom harvesters to move from State to State as the crop matures. However, there is more overlap of harvest dates for corn and soybeans than for wheat between regions, making between-area custom work infeasible. One could conclude, then, that it is less practical to move machines great distances for crops other than wheat.

Another factor encouraging movement of custom wheat combines from State to State is extreme weather variability in the Plains, creating a high risk

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10/ See (8) for a discussion of such plans. The incentive to landowners was the rising grain price levels in 1973, which improved tenant income relatively more than landowner income.

Table 13--Planting and harvesting dates for various crops, by regions

Crop and state	Planting	Harvesting
Corn:		
North Carolina	April 5 - June 5	Oct. 5 - Nov. 15
Kentucky	April 25 - June 20	Oct. 5 - Nov. 5
Illinois	May 5 - June 20	Oct. 20 - Nov. 15
Minnesota	May 10 - June 5	Oct. 21 - Nov. 9
Soybeans:		
Louisiana	May 1 - June 25	Oct. 1 - Nov. 1
Arkansas	May 1 - June 20	Oct. 15 - Nov. 10
Illinois	May 10 - June 30	Sept. 25 - Oct. 10
Minnesota	May 15 - June 10	Oct. 7 - Oct. 20
Wheat:		
Texas	Sept. 1 - Nov. 20	June 2 - June 25
Oklahoma	Sept. 1 - Oct. 25	June 10 - June 20
Kansas	Sept. 10 - Nov. 1	June 20 - July 5
Nebraska	Sept. 1 - Oct. 1	July 10 - July 20
South Dakota	{April 1 - May 1 {Sept. 1 - Oct. 1	July 25 - Aug. 10 July 15 - Aug. 25
North Dakota	{April 10 - May 20 {Sept. 10 - Oct. 10	Aug. 1 - Aug. 20

Source: (12).

of losing a wheat crop if not harvested as soon as it matures. A third fact making the situation different is that corn harvest, especially, involves a system of harvesting, drying, and storing which must be closely integrated. It is generally not feasible to have enough drying capacity on a farm to accommodate a custom harvesting fleet.

One would tentatively conclude from these data that for crops other than wheat, the neighborhood or local area type custom work has an advantage over between-area work. Observation suggests that, in fact, this type of operation accounts for a majority of the custom work currently done.

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APPENDIX

Appendix table 1--Farms by economic class, 1959, 1964, and 1969

Category	1969		1964		1959	
	Number	Percent	Number	Percent	Number	Percent
Class 1	221,690	8.1	141,914	4.5	102,099	2.8
Class 2	330,992	12.1	259,898	8.2	210,402	5.7
Class 3	395,472	14.5	467,096	14.8	483,004	13.0
Class 4	390,425	14.3	504,614	16.0	653,881	17.6
Class 5	395,104	14.5	443,918	14.1	617,677	16.6
Class 6	192,564	7.1	348,272	11.0	348,954	9.4
Part time	574,546	21.0	639,409	20.0	884,785	23.9
Part retirement	227,346	8.3	350,558	11.0	404,110	10.9
Abnormal	2,111	0.1	2,178	0.1	3,061	0.1
Total	2,730,250	100.0	3,157,857	100.0	3,707,973	100.00

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Chapter 7, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix Table 2--Number of farms, number with income from custom work and other agricultural services, and amount of income, all farms and class 1-5 farms by regions, 1969

Category	Farm numbers		Farms with custom work income		Income from custom work	
	All farms	Class 1-5	All farms	Class 1-5	All farms	Class 1-5
	- - - - - - - - - - - - -	-Farms-	- - - - - - - - - - - -		- - -1,000 dollars- - -	
United States:	2,730,250	1,733,683	306,760	260,174	509,614	471,389
Northeast	151,866	96,723	13,533	10,446	18,649	16,396
North Central	1,151,884	867,929	168,377	155,201	212,715	202,274
South	1,161,399	583,179	93,177	67,410	165,130	145,766
West	265,101	185,852	31,673	27,117	113,120	106,953
Geographic divisions:						
New England	28,640	18,607	2,452	1,683	4,796	4,129
Middle Atlantic	123,226	78,116	11,081	8,763	13,853	12,267
East North Central	513,295	355,129	68,109	61,231	76,933	72,663
West North Central	638,589	512,800	100,268	93,970	135,782	129,612
South Atlantic	370,567	192,999	27,808	19,541	47,780	42,485
East South Central	391,543	163,963	27,781	17,665	37,456	31,554
West South Central	399,289	226,217	37,588	30,204	79,894	71,726
Mountain	119,902	90,589	16,311	14,464	38,568	36,203
Pacific	145,199	15,362	15,362	12,653	74,552	70,750

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 2, Farms: Number, Use of Land, Size of Farm, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 3--Number of farms, number with income from custom work and other agricultural services, and amount of income, selected states, 1969

Region and State	All farms: Total	All farms: With income from custom work	All farms: Income	Class 1-5 farms: Total	Class 1-5 farms: With income from custom work	Class 1-5 farms: Income
	Farms	Farms	1,000 dollars	Farms	Farms	1,000 dollars
Corn Belt:						
Ohio	111,332	14,373	14,765	66,269	12,247	13,760
Indiana	101,479	12,971	14,345	67,264	11,695	13,390
Illinois	123,565	21,370	28,675	100,486	20,317	27,807
Iowa	140,354	25,123	34,797	123,495	24,365	33,961
Missouri	137,067	3,307	6,096	86,503	2,999	5,771
Total	613,797	77,144	98,678	444,017	71,623	94,689
Plains:						
North Dakota	46,381	7,669	8,832	41,528	7,345	8,507
South Dakota	45,726	7,313	10,272	40,470	7,017	9,860
Kansas	86,057	15,713	25,393	68,394	14,551	23,902
Nebraska	72,257	12,173	17,896	63,385	11,707	17,245
Total	250,421	42,868	62,394	213,777	40,620	59,514
Delta:						
Arkansas	60,433	5,144	9,976	33,669	3,891	8,796
Louisiana	42,269	2,767	6,671	20,075	1,971	5,895
Mississippi	72,577	5,365	9,683	51,675	3,244	8,311
Total	175,279	13,276	26,331	105,419	9,106	23,001

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 7, pp. 44-45, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 4--Number of farms in classes 1-5, number with income from custom work and other agricultural services, and amount of income, 1969

Category	Class 1	Class 2	Class 3	Class 4	Class 5	Classes 1-5
			-Farms-			
Number of farms	221,690	330,992	395,472	390,425	395,104	1,733,683
Number reporting custom work	47,597	70,718	66,525	44,404	30,930	260,174
Number of farms with custom work income of:						
$1-$249	7,722	16,755	18,648	14,184	11,058	68,367
$250-$499	6,603	12,494	12,035	8,008	5,338	44,478
$500-$999	8,979	14,319	12,874	7,723	4,973	48,868
$1,000-$4,999	18,047	22,476	18,850	11,733	7,808	78,914
$5,000-$9,999	3,485	3,021	2,581	2,026	1,190	12,303
$10,000 and over	2,761	1,653	1,537	730	563	7,244
Income from custom work	157,746	115,636	99,196	58,840	39,971	471,389
Income per farm doing custom work	3,314	1,635	1,491	1,325	1,292	1,811
			-1,000 dollars-			

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 7, pp. 68-69, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 5--Farm with income from custom work and other agricultural services, classes 1-5 by type of farm and amount of income, 1969

Type of farm	Total number of farms	Income from custom work						Total with custom income	
		$1-$249	$250-$499	$500-$999	$1,000-$4,999	$5,000 $9,999	$10,000 +	Number	Income
	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	-Farms-	- - - - - - - - - -	- - - - - - - - - -	- - - - - - - - - -	1,000 dollars
All farms in classes 1-5	1,733,683	68,367	44,478	48,868	78,914	12,303	7,244	260,174	471,389
Type:									
Cash grain	369,312	16,515	12,834	15,421	26,616	3,981	1,889	77,256	134,675
Tobacco	89,903	2,298	1,097	1,030	1,920	287	114	6,746	9,215
Cotton	40,534	925	900	1,341	2,981	619	368	7,134	19,971
Other field crops	31,190	884	758	992	2,060	408	322	5,424	20,759
Vegetables	19,660	458	263	281	691	174	277	2,094	9,948
Fruit and nut	53,754	950	578	679	1,830	631	750	5,418	31,871
Poultry	57,545	1,003	544	649	1,191	330	227	3,944	10,939
Dairy	260,956	13,472	6,862	6,214	6,742	686	366	34,342	33,347
Livestock (excluding poultry and dairy)	568,201	24,500	15,724	16,561	24,106	3,086	1,501	85,474	120,657
Livestock ranches	79,683	1,083	746	854	1,896	432	272	5,283	13,941
General	126,527	5,795	3,896	4,577	8,207	1,427	800	24,782	50,603
Miscellaneous	36,418	484	276	269	674	246	328	2,277	15,463

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 40-41, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 6--Farms with expenditures for contract labor, machine hire, and custom work, by economic class of farms and amount of expenditure, 1969

Category	All farms	Class 1-5	Class 6	Part time	Part retirement	Abnormal
	- - - - -	- - - - -	- - -Farms-	- - - - -	- - - - -	- - - - -
Expenditures:						
$1-$99	282,839	129,029	27,120	91,781	34,860	49
$100-$499	666,567	483,303	32,859	108,565	41,597	243
$500-$999	252,282	235,498	3,106	9,914	3,617	147
$1,000-$2,499	176,660	172,344	803	2,605	749	159
$2,500-$4,999	51,574	51,046	113	240	87	88
$5,000-$9,999	21,559	21,410	27	37	16	69
$10,000 and over	13,355	13,293	--	--	--	62
Number of farms with expenditures	1,464,836	1,105,923	64,028	213,142	80,926	817
Total number of farms	2,730,250	1,733,683	192,564	574,546	227,346	2,111
Expenditure (thousand dollars)	1,405,259	1,348,760	12,028	38,471	14,313	2,847

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Chapter 7, p. 60, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 7--Class 1-5 cash grain farms: income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	369,312	33,168	71,495	95,764	89,888	78,997
Percent of total	Pct.	100	9.0	19.4	25.9	24.3	21.4
Income from custom work and related agricultural services:							
$1-$249	Farms	16,515	1,020	3,648	5,137	4,090	2,620
$250-$499	do.	12,834	1,174	5,570	4,097	2,519	1,474
$500-$999	do.	15,421	1,969	4,638	4,742	2,618	1,454
$1,000-$4,999	do.	26,616	4,613	8,139	7,277	4,320	2,267
$5,000-$9,999	do.	3,981	889	1,066	998	676	352
$10,000 and above	do.	1,889	534	515	476	219	145
Total:							
Number of farms	do.	77,256	10,199	21,576	22,727	14,442	8,312
Income	1,000 dollars	134,675	30,036	37,862	35,632	19,920	11,226
Total farm production expenses, all farms	do.	4,793,760	1,677,341	1,333,726	977,022	505,376	300,295
Expenses for machine hire and custom work:							
$1-$499	Farms	118,914	5,776	19,041	29,426	31,133	33,565
$500-$999	do.	59,627	4,265	11,366	16,204	16,392	11,400
$1,000-$4,999	do.	58,652	9,529	17,085	17,920	10,378	3,740
$5,000-$9,999	do.	4,071	2,179	1,205	466	151	70
$10,000 and above	do.	1,187	1,129	54	4	--	--
Total:							
Number of farms	do.	242,451	22,878	48,724	64,020	58,054	48,775
Expense	1,000 dollars	230,134	62,189	55,884	53,731	36,412	21,919

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 64, 68, 71, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 8--Class 1-5 tobacco farms: income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	89,903	2,055	7,404	17,135	29,655	33,654
Percent of total	Pct.	100	2.3	8.2	19.1	33.0	37.4
Income from custom work and related agricultural services:							
$1-$249	Farms	2,298	45	181	440	752	880
$250-$499	do.	1,097	37	160	274	348	278
$500-$999	do.	1,030	64	195	250	291	230
$1,000-$4,999	do.	1,920	234	498	464	359	365
$5,000-$9,999	do.	287	47	74	57	84	25
$10,000 and above	do.	114	24	27	42	11	10
Total:							
Number of farms	do.	6,746	451	1,135	1,527	1,845	1,788
Income	1,000 dollars	9,215	1,426	2,336	2,162	1,831	1,460
Total farm production expenses, all farms	do.	575,125	120,019	122,042	137,160	113,269	82,633
Expenses for machine hire and custom work:							
$1-$499	Farms	41,059	371	2,530	8,431	14,925	14,802
$500-$999	do.	6,440	371	1,681	2,312	1,389	687
$1,000-$4,999	do.	2,954	632	1,140	726	294	162
$5,000-$9,999	do.	84	24	12	13	14	21
$10,000 and above	do.	16	16	--	--	--	--
Total:							
Number of farms	do.	50,553	1,414	5,363	11,482	16,682	15,672
Expense	1,000 dollars	17,192	2,039	3,622	4,537	4,058	2,936

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 80, 84, 87, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 9--Class 1-5 cotton farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	40,534	4,441	5,689	7,629	8,597	14,178
Percent of total	Pct.	100	11.0	14.0	18.8	21.2	35.0
Income from custom work and related agricultural services:							
$1-$249	Farms	925	69	119	178	231	328
$250-$499	do.	900	71	157	236	221	215
$500-$999	do.	1,341	127	280	344	305	285
$1,000-$4,999	do.	2,981	495	706	795	543	442
$5,000-$9,999	do.	619	156	162	162	91	48
$10,000 and above	do.	368	149	86	83	36	14
Total:							
Number of farms	do.	7,134	1,067	1,510	1,798	1,427	1,332
Income	1,000 dollars	19,971	6,371	4,671	4,522	2,595	1,813
Total farm production expenses, all farms	do.	816,973	458,328	148,849	100,938	58,391	50,466
Expenses for machine hire and custom work:							
$1-$499	Farms	9,032	217	664	1,365	2,120	4,666
$500-$999	do.	6,481	264	789	1,349	1,584	2,495
$1,000-$4,999	do.	9,562	1,554	2,247	2,581	2,060	1,120
$5,000-$9,999	do.	1,108	657	326	87	25	13
$10,000 and above	do.	592	555	31	6	--	--
Total:							
Number of farms	do.	26,775	3,247	4,057	5,388	5,789	8,294
Expense	1,000 dollars	48,889	23,534	8,289	7,814	5,297	4,555

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 96, 100, 103, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 10--Class 1-5 other field crop farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	31,190	7,168	6,713	6,508	5,819	4,982
Percent of total	Pct.	100	23.0	21.5	20.9	18.7	16.0
Income from custom work and related agricultural services:							
$1-$249	Farms	884	159	220	216	162	127
$250-$499	do.	758	143	222	200	121	72
$500-$999	do.	992	262	306	226	120	78
$1,000-$4,999	do.	2,060	780	570	386	215	109
$5,000-$9,999	do.	408	199	112	49	36	12
$10,000 and above	do	322	199	61	43	10	9
Total:							
Number of farms	do.	5,424	1,742	1,491	1,120	664	407
Income	1,000 dollars	20,758	13,184	3,925	2,125	973	551
Total farm production expenses, all farms	do.	1,124,122	854,024	148,211	73,727	31,130	17,031
Expenses for machine hire and custom work:							
$1-$499	Farms	7,672	766	1,423	1,737	1,751	1,995
$500-$999	do.	4,546	716	1,052	1,099	1,096	583
$1,000-$4,999	do.	6,624	2,345	1,942	1,487	662	188
$5,000-$9,999	do.	823	626	142	42	11	2
$10,000 and above	do.	598	566	29	3	--	--
Total:							
Number of farms	do.	20,263	5,019	4,588	4,368	3,520	2,768
Expense	1,000 dollars	39,980	25,934	6,570	4,103	2,238	1,135

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 112, 116, 119, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 11--Class 1-5 vegetable farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	19,660	4,688	2,890	3,392	4,256	4,434
Percent of total	Pct.	100	23.8	14.7	17.3	21.6	22.6
Income from custom work and related agricultural services:							
$1-$249	Farms	458	65	82	102	117	92
$250-$499	do.	263	55	53	51	53	51
$500-$999	do.	281	88	54	48	50	41
$1,000-$4,999	do.	691	286	119	100	98	88
$5,000-$9,999	do.	174	102	27	17	19	9
$10,000 and above	do.	227	155	30	23	13	6
Total:							
Number of farms	do.	2,094	751	365	341	350	287
Income	1,000 dollars	9,948	6,708	1,311	812	706	410
Total farm production expenses, all farms	do.	980,168	846,945	62,824	34,105	21,430	14,864
Expenses for machine hire and custom work:							
$1-$499	Farms	4,947	480	685	995	1,390	1,397
$500-$999	do.	1,458	411	347	308	252	140
$1,000-$4,999	do.	2,047	1,133	476	259	122	57
$5,000-$9,999	do.	415	368	42	5	--	--
$10,000 and above	do.	470	462	8	--	--	--
Total:							
Number of farms	do.	9,337	2,854	1,558	1,567	1,764	1,594
Expense	1,000 dollars	24,708	21,127	1,666	8,986	618	397

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 128, 132, 135, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 12--Class 1-5 fruit and nut farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	53,754	8,441	8,515	10,660	12,819	13,319
Percent of total	Pct.	100	15.7	15.8	19.8	23.8	24.8
Income from custom work and related agricultural services:							
$1-$249	Farms	950	132	172	208	245	193
$250-$499	do.	578	94	133	117	134	100
$500-$999	do.	679	147	144	148	140	100
$1,000-$4,999	do.	1,830	440	433	364	329	264
$5,000-$9,999	do.	631	193	140	110	124	64
$10,000 and above	do.	750	367	160	132	47	44
Total:							
Number of farms	do.	5,418	1,373	1,182	1,079	1,019	765
Income	1,000 dollars	31,871	16,264	6,696	4,457	2,555	1,900
Total farm production expenses, all farms	do.	1,430,016	979,354	189,751	121,967	78,617	60,327
Expenses for machine hire and custom work:							
$1-$499	Farms	14,220	1,133	2,123	2,976	3,965	4,023
$500-$999	do.	5,151	813	963	1,151	1,199	1,025
$1,000-$4,999	do.	7,180	2,052	1,584	1,529	1,220	795
$5,000-$9,999	do.	878	532	207	79	32	28
$10,000 and above	do.	533	466	47	10	4	6
Total:							
Number of farms	do.	27,962	4,996	4,924	5,745	6,420	5,877
Expense	1,000 dollars	40,061	20,791	6,649	5,276	4,139	3,207

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 144, 148, 151, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 13--Class 1-5 poultry farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	57,545	27,026	15,484	7,405	4,210	3,420
Percent of total	Pct.	100	47.0	26.9	12.9	7.3	5.9
Income from custom work and related agricultural services:							
$1-$249	Farms	1,003	446	270	106	110	71
$250-$499	do.	544	300	136	52	23	33
$500-$999	do.	649	420	123	55	29	22
$1,000-$4,999	do.	1,191	717	282	121	39	32
$5,000-$9,999	do	330	218	81	11	9	11
$10,000 and above	do	227	195	11	13	8	--
Total:							
Number of farms	do.	3,944	2,296	903	358	218	169
Income	1,000 dollars	10,939	8,360	1,510	603	293	172
Total farm production expenses, all farms	do.	3,505,116	2,924,659	421,025	109,231	32,920	16,280
Expenses for machine hire and custom work:							
$1-$499	Farms	15,459	6,656	4,369	2,136	1,246	1,052
$500-$999	do.	3,912	2,466	965	308	125	48
$1,000-$4,999	do.	2,423	1,883	413	87	27	13
$5,000-$9,999	do.	118	99	11	--	3	5
$10,000 and above	do.	44	42	2	--	--	--
Total:							
Number of farms	do.	21,956	11,146	5,760	2,531	1,401	1,118
Expense	1,000 dollars	11,917	8,437	2,207	705	335	232

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 160, 164, 167, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 14--Class 1-5 dairy farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	260,956	34,658	81,942	78,975	45,436	19,945
Percent of total	Pct.	100	13.3	31.4	30.3	17.4	7.6
Income from custom work and related agricultural services:							
$1-$249	Farms	13,472	1,651	5,102	4,376	1,732	611
$250-$499	do.	6,862	1,067	2,885	1,961	727	222
$500-$999	do.	6,214	1,281	2,580	1,639	548	166
$1,000-$4,999	do.	6,742	1,869	2,737	1,432	525	179
$5,000-$9,999	do.	686	242	219	122	83	20
$10,000 and above	do.	366	128	119	102	16	1
Total:							
Number of farms	do.	34,342	6,238	13,642	9,632	3,631	1,199
Income	1,000 dollars	33,347	10,378	12,245	7,266	2,661	797
Total from production expenses, all farms	do.	4,674,006	2,073,121	1,527,960	774,944	231,543	66,439
Expenses for machine hire and custom work:							
$1-$499	Farms	112,614	8,552	32,475	38,653	23,214	9,720
$500-$999	do.	32,697	5,210	14,000	9,781	2,977	729
$1,000-$4,999	do.	19,784	7,271	8,879	3,004	524	106
$5,000-$9,999	do.	664	526	77	36	17	8
$10,000 and above	do.	178	178	--	--	--	--
Total:							
Number of farms	do.	165,937	21,737	55,431	51,474	26,732	10,563
Expense	1,000 dollars	86,695	26,387	31,556	19,259	7,191	2,301

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 176, 180, 183, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 15--Class 1-5 livestock farms other than poultry and dairy farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	568,201	72,510	96,397	119,338	131,059	148,897
Percent of total	Pct.	100	12.8	17.0	21.0	23.1	26.2
Income from custom work and related agricultural services:							
$1-$249	Farms	24,500	3,649	5,776	5,966	4,864	4,245
$250-$499	do.	15,724	3,195	4,143	3,761	2,693	1,932
$500-$999	do.	16,561	3,915	4,636	3,869	2,455	1,686
$1,000-$4,999	do.	24,106	6,754	6,372	5,176	3,324	2,480
$5,000-$9,999	do.	3,082	929	708	586	517	342
$10,000 and above	do.	1,501	489	345	354	182	131
Total:							
Number of farms	do.	85,474	18,931	21,980	19,712	14,035	10,816
Income	1,000 dollars	120,657	38,149	29,276	25,232	16,182	11,818
Total farm production expenses, all farms	do.	12,947,814	8,135,587	2,099,923	1,335,401	774,688	602,416
Expenses for machine hire and custom work:							
$1-$499	Farms	220,358	17,149	33,376	49,295	57,147	63,391
$500-$999	do.	78,976	13,851	20,523	20,583	14,329	9,690
$1,000-$4,999	do.	56,690	21,334	16,851	10,995	5,024	2,486
$5,000-$9,999	do.	2,470	1,805	346	144	83	92
$10,000 and above	do.	736	726	9	1	--	--
Total:							
Number of farms	do.	359,230	54,865	71,105	81,018	76,583	75,659
Expense	1,000 dollars	233,860	83,815	53,359	43,721	29,934	23,031

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 192, 196, 199, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 16--Class 1-5 livestock ranches: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	79,683	10,378	10,405	14,443	19,807	24,290
Percent of total	Pct.	100	13.5	13.1	18.1	24.9	30.5
Income from custom work and related agricultural services:							
$1-$249	Farms	1,083	94	150	254	283	302
$250-$499	do.	746	93	140	147	176	190
$500-$999	do.	854	92	170	181	228	183
$1,000-$4,999	do.	1,896	261	308	438	467	422
$5,000-$9,999	do.	432	83	74	100	98	77
$10,000 and above	do.	272	88	55	45	47	37
Total:							
Number of farms	do.	5,283	711	897	1,165	1,299	1,211
Income	1,000 dollars	13,941	4,143	2,213	2,676	2,673	2,237
Total farm production expenses, all farms	do.	2,427,754	1,766,348	244,739	176,417	127,561	112,689
Expenses for machine hire and custom work:							
$1-$499	Farms	18,644	1,101	2,069	3,520	5,354	6,600
$500-$999	do.	6,716	909	1,279	1,500	1,626	1,402
$1,000-$4,999	do.	6,674	2,295	1,618	1,269	882	610
$5,000-$9,999	do.	614	452	86	21	30	25
$10,000 and above	do.	270	268	2	--	--	--
Total:							
Number of farms	do.	32,918	5,025	5,054	6,310	7,892	8,637
Expense	1,000 dollars	31,787	15,260	5,009	4,170	3,864	3,483

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 208, 212, 215, U. S. Government Printing Office, Washington, D.C., 1973.

Appendix table 17--Class 1-5 general farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	126,527	11,317	19,672	29,159	32,886	33,493
Percent of total	Pct.	100	8.9	15.5	23.0	26.0	26.5
Income from custom work and related agricultural services:							
$1-$249	Farms	5,795	361	982	1,601	1,480	1,371
$250-$499	do.	3,896	351	857	1,094	943	651
$500-$999	do.	4,577	593	1,166	1,327	882	609
$1,000-$4,999	do.	8,207	1,527	2,223	2,195	1,387	875
$5,000-$9,999	do.	1,427	397	332	315	235	148
$10,000 and above	do.	880	338	184	169	113	76
Total:							
Number of farms	do.	24,782	3,567	5,744	6,701	5,040	3,730
Income	1,000 dollars	50,603	15,597	11,702	11,357	7,215	4,731
Total farm production expenses, all farms	do.	1,996,166	964,391	404,829	313,544	183,670	129,732
Expenses for machine hire and custom work:							
$1-$499	Farms	44,668	1,466	5,267	10,256	13,180	14,499
$500-$999	do.	18,580	1,405	3,751	5,272	4,893	3,259
$1,000-$4,999	do.	18,286	3,762	5,458	5,123	2,749	1,194
$5,000-$9,999	do.	1,532	973	382	117	33	27
$10,000 and above	do.	953	929	22	2	--	--
Total:							
Number of farms	do.	84,019	8,535	14,880	20,770	20,855	18,979
Expense	1,000 dollars	100,487	49,174	17,505	15,912	10,787	7,109

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 224, 228, 231, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 18--Class 1-5 miscellaneous farms: Income from custom work and related agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Total class 1-5	Class 1	Class 2	Class 3	Class 4	Class 5
All farms	Farms	36,418	5,480	4,386	5,064	5,993	15,495
Percent of total	Pct.	100	15.0	12.0	13.9	16.5	42.5
Income from custom work and related agricultural services:							
$1-$249	Farms	484	31	53	64	118	218
$250-$499	do.	276	23	38	45	50	120
$500-$999	do.	269	21	27	45	57	119
$1,000-$4,999	do.	674	71	89	102	127	285
$5,000-$9,999	do.	246	30	26	54	54	82
$10,000 and above	do.	328	95	60	55	28	90
Total:							
Number of farms	do.	2,077	271	293	365	434	914
Income	1,000 dollars	15,463	7,132	1,890	2,351	1,235	2,856
Total farm production expenses, all farms	do.	977,435	704,779	84,462	48,603	29,670	109,920
Expenses for machine hire and custom work:							
$1-$499	Farms	7,609	571	810	1,136	1,458	3,634
$500-$999	do.	1,522	327	286	270	224	415
$1,000-$4,999	do.	1,619	579	268	165	148	459
$5,000-$9,999	do.	196	102	13	7	8	66
$10,000 and above	do	95	77	2	2	--	15
Total:							
Number of farms	do.	11,041	1,656	1,379	1,579	1,838	4,589
Expense	1,000 dollars	9,352	4,103	958	752	703	2,836

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 8, pp. 240, 244, 247, U. S. Government Printing Office, Washington, D. C., 1973.

Appendix table 19--Class 1A farms: Farm income and expenses from custom work and other agricultural services, total farm production expenses, and expenditures for machine hire and custom work, 1969

Category	Unit	Class 1A total	Value of sales						
			$100,000-$199,999	$200,000-$299,999	$300,000-$399,999	$400,000-$499,999	$500,000-$699,999	$700,000-$999,999	$1,000,000 +
All farms	Farms	51,995	35,308	7,926	3,145	1,537	1,531	962	1,586
Percent of total	Pct.	100.0	67.9	15.2	6.0	3.0	2.9	1.9	3.0
Income from custom work and related agricultural services:									
$1-$249	Farms	962	798	112	31	6	9	3	3
$250-$499	do.	901	755	93	26	10	9	5	3
$500-$999	do.	1,400	1,158	151	48	16	11	11	5
$1,000-$4,999	do.	3,449	2,625	514	137	66	52	24	31
$5,000-$9,999	do.	960	693	127	60	24	25	14	17
$10,000 and above	do.	1,276	667	206	114	61	83	53	92
Total:									
Number of farms	do.	8,948	6,696	1,203	416	183	189	110	151
Income	1,000 dollars	69,430	29,325	9,355	4,709	3,128	4,841	4,782	13,290
Total farm production expenses, all farms	do.	13,665,600	4,036,954	1,673,616	953,405	617,975	812,471	720,766	4,850,413
Expenses for machine hire and custom work:									
$1-$9,999	Farms	27,419	20,518	3,813	1,345	579	513	289	362
$10,000 +	do.	3,939	1,547	775	423	263	306	210	415
Total:									
Number of farms	do.	31,358	22,065	4,588	1,768	842	819	499	777
Expense	1,000 dollars	178,070	69,244	26,799	14,634	9,784	12,246	10,053	35,311

U. S. Bureau of the Census, Census of Agriculture, 1969, Vol. II, General Report, Ch. 7, pp. 81, 84, 86.

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